

## Section 2

# **Student Research and Internships**

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## Introduction

The Science and Technology Base Student and Education Program Office (EPO) at Los Alamos National Laboratory (LANL, the Laboratory) offers internships and cooperative educational experiences for high school, undergraduate, and graduate students. The purpose of these programs is to provide quality students with the opportunity to develop employability skills, gain valuable work experience, and participate in intensive

educational modules. Students receive exposure to a variety of technical and administrative career fields under the guidance of Laboratory staff members and mentors. By offering these internship and cooperative educational experiences, the Laboratory plans to attract and retain quality students who will choose the Laboratory as the place to launch their careers.



# High School Cooperative Program



## High School Cooperative Program

**Program Description.** The High School Cooperative Program at the Laboratory provides eligible high school juniors and seniors with the opportunity to develop basic employability skills and gain valuable work experience while being exposed to a variety of technical and administrative career fields.

A unique component of the high school program is that the participating high school career or guidance counselors establish their schools' eligibility criteria for students to participate and receive credit. They screen the students for aptitudes, interests, grade point average, and number of credits toward graduation. Alternative and home-schooled students are also eligible to apply through their designated contact.

High school program participants have the opportunity for full-time work during the summer and may continue their appointments in part-time status during the academic year.

The Laboratory conducts scheduled campus visits and presentations each spring to increase awareness of the program and to recruit new participants for the coming year. Follow-ups with the participating schools are conducted in the fall in an effort to review programmatic changes in eligibility requirements.

**Program Goal, Objectives, and Milestones.** The high school program is designed to complement

the students' education with practical experience related to their academic interests while supporting learning that will enhance their education at the postsecondary level.

### **Highlights of This Year's Accomplishments.**

During fiscal year 2002 (FY02), high school recruitment by the Laboratory increased from 10 to 20 high schools when outreach was expanded from the local area to regional high schools. This effort increased awareness about the Laboratory, the internship opportunities available, and the diversity of the participants in the program. The outreach effort included Bernalillo, Capital, Coronado, Cuba, Dulce, Escalante, Española Valley, Jemez Valley, Los Alamos, McCurdy, Mesa Vista, Mora, Pecos, Peñasco, Pojoaque, Rio Rancho, Santa Fe, Santa Fe Indian, Santa Fe Prep, St. Michael's, and Taos High Schools.

During 2002, students worked in areas including computing, human resources, education, bio-sciences, and engineering.

This year, for the first time, a high school student participated in the annual LANL student symposium, presenting a poster entitled "Building a Computer Server from Scratch" at Symposium 2002: *Championing Scientific Careers*.

See Figure 47 for information on the ethnicity and gender of high school cooperative students.

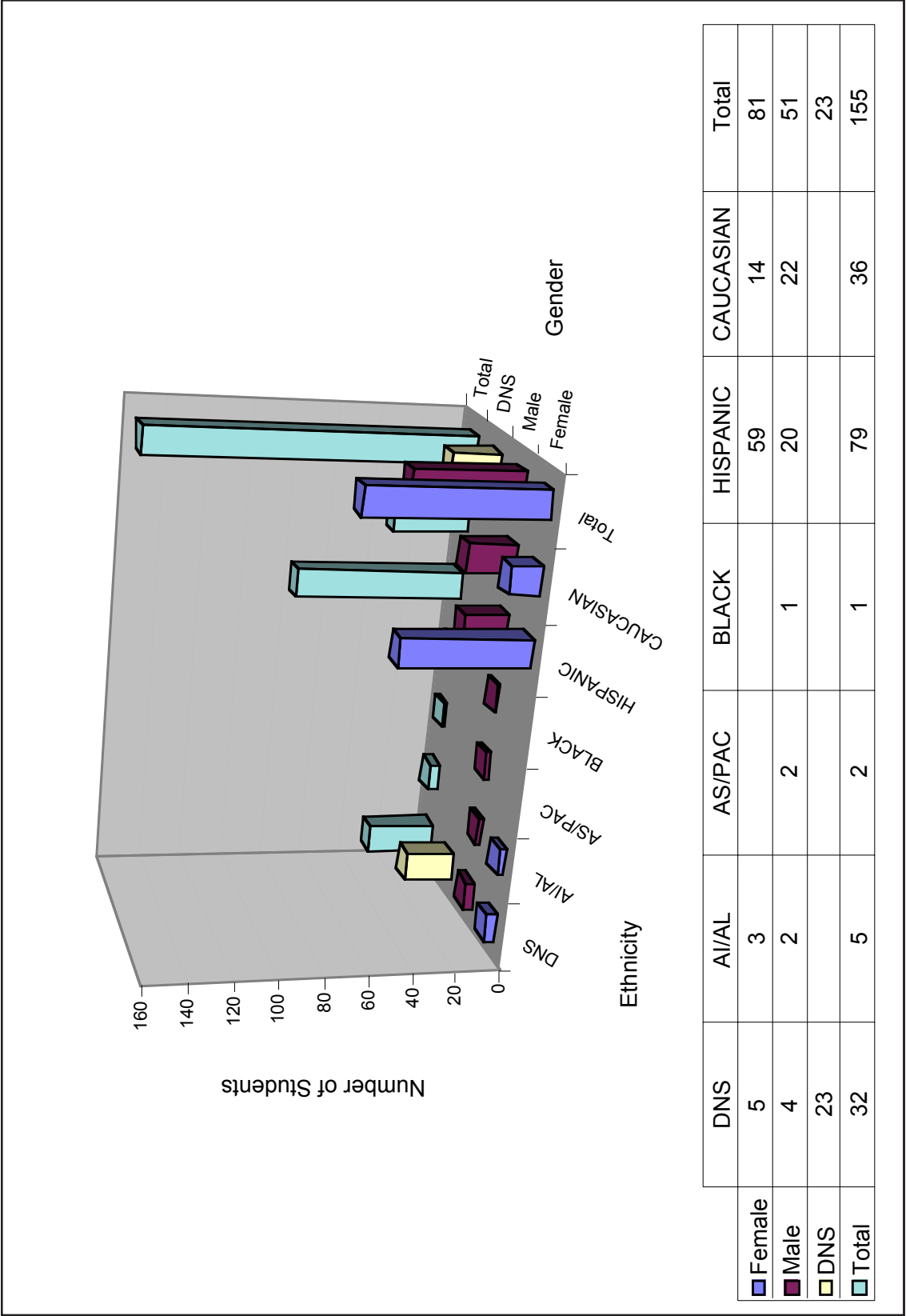


Figure 47. FY02 ethnicity and gender of high school cooperative students.



# Undergraduate Research



## Undergraduate Program

**Program Description.** The Undergraduate Student (UGS) Program at the Laboratory represents a significant and integral part of the total recruiting strategy in meeting LANL's future workforce needs for highly skilled and well-educated entry-level employees.

Internships consist of summer, part-time, and full-time appointments for students who have graduated from high school and have been accepted and enrolled in an undergraduate program. Internships are year-round and provide students with relevant research experience under the tutelage of mentors and technologically advanced equipment, instruments, and research facilities.

Appointments are available in both technical and administrative fields for 90-day summer internships. Students have the option of continuing part-time work during the academic year. The maximum appointments in the program are three years for those pursuing an associate's degree and six years for those pursuing a bachelor's degree.

The postbaccalaureate category of the UGS program offers college graduates the opportunity to participate in the program for a maximum of one year after graduation. The intent of this category is to provide students with the opportunity to determine their future professional and academic objectives. Students wanting to continue their educations will have this time to take graduate school admission tests and to apply to their chosen institutions. Once accepted and enrolled in a graduate program, the students transition to the Graduate Research Assistant (GRA) program at the Laboratory.

Selection into a technical or administrative Laboratory staff position is an option available to

undergraduate students whose unique skills and credentials qualify them for selection into a competitively advertised position. Students also have the invaluable opportunity to participate in the annual student symposium at which they can showcase their research or project results.

**Program Goal, Objectives, and Milestones.** The UGS program provides participants with the opportunity to make meaningful contributions to the Laboratory's mission, to develop personal and professional career networks, and to explore the possibility of future full-time employment.

The strategic recruiting effort to help increase the diversity of the Laboratory's student and entry-level workforce in FY02 involved collaboration with various campuses throughout the nation and with all of the two- and four-year New Mexico institutions. Specific campus recruitment activities were carried out at New Mexico State University, New Mexico Highlands University, the University of New Mexico main campus in Albuquerque, the University of New Mexico at Los Alamos, the University of New Mexico at Taos, New Mexico Institute of Mining and Technology, Northern New Mexico Community College, Luna Community College, St. John's College, the College of Santa Fe, and Santa Fe Community College. Program presentations were made available at local-area job fairs and at conferences held by the American Indian Science and Engineering Society, the New Mexico Alliance for Graduate Education and the Professoriate, and the Cooperative Education and Internship Association to ensure that information was presented to potential student interns.

Milestones are shown in Table 15. All milestones were met in FY02.

Table 15. FY02 Milestones

October 2001–June 2002	College recruiting at 12 New Mexico campuses
April–May 2002	Evaluation of student eligibility and review of transcripts
May–July 2002	Completion of the transcript-review process

**Highlights of This Year’s Accomplishments.** An evaluation of the transcript verification process in FY02 showed an urgent need to modify the system so that EPO staff members could monitor the program’s eligibility requirements more efficiently.

The process in place at the time required returning and continuing students to submit their transcripts by April 1 each year. As a result, the information provided was inconsistent or insufficient for the determination of eligibility and salary levels. In many cases, spring enrollment results were not reflected on the transcripts. In addition, EPO determined that there were key communication gaps among students, mentors, and other stakeholders.

EPO developed a communications and implementation plan and a timeline defining roles and responsibilities. When the new process is initiated, continuing and returning students will be required

to submit their transcripts by mid-February. This requirement should allow EPO sufficient time to review the students’ eligibility and resolve any discrepancies before the summer internships begin. Students working during the academic year will be required to register for a minimum of three-quarters of

full-time enrollment. This course-load requirement will not apply to graduate students working on a thesis or to interns who have earned their bachelor’s or master’s degrees—although they are encouraged to take classes. The improved process will be implemented in two years.

In FY02, approximately 118 undergraduate students presented posters and/or oral technical talks to their peers, mentors, and representatives from professional societies at Symposium 2002. Of the 16 outstanding poster and oral-presentation awards distributed to undergraduate, graduate, and postdoctoral researchers, eight were awarded for undergraduate poster and oral presentations. Both awards for engineering went to UGS students. The awards were indicative of the caliber of undergraduate students that the Laboratory attracts.

Ethnicity and gender information is displayed in Figure 48.

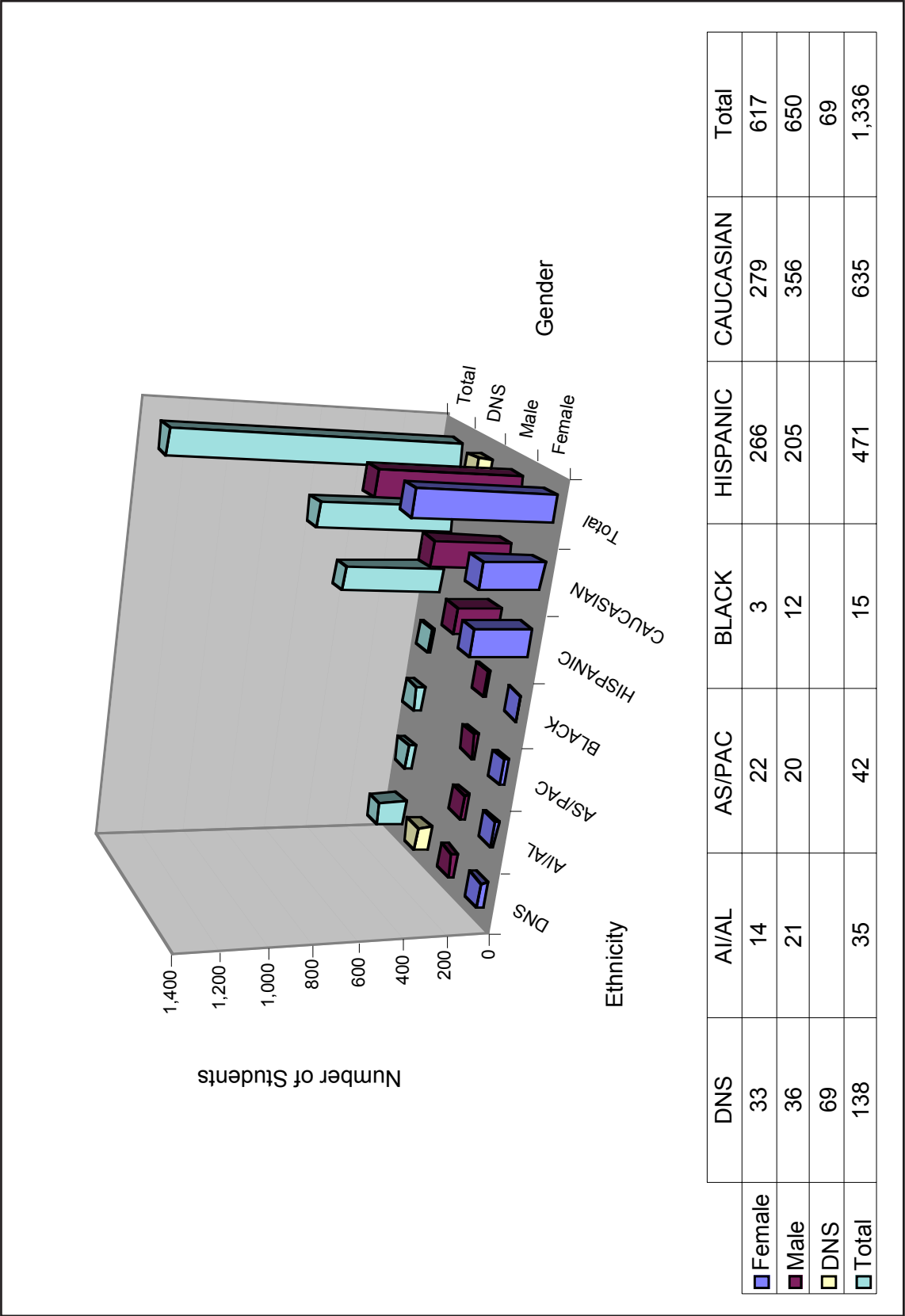


Figure 48. FY02 ethnicity and gender of UGS students.

## College Cooperative Program

**Program Description.** The College Cooperative Program (CCP) provides a unique and challenging off-campus research opportunity at Los Alamos National Laboratory (the Laboratory) for upper-division undergraduate students majoring in science, mathematics, technology, and engineering. Selected students and Laboratory scientists work together on significant research problems, providing the students with a rich research experience not typically available at undergraduate institutions.

Developed in 2001 and implemented in August 2002, The program was designed to be similar to the Laboratory's successful Massachusetts Institute of Technology Engineering Internship Program and the former Department of Energy/Defense Programs Undergraduate Research Semester Program.

The program places special emphasis on recruiting and selecting women and underrepresented minorities in science and engineering fields.

Technical staff members serving as tutors and mentors volunteer their time to guide individual undergraduate students through the 16-week research semester appointment. The two-part, 16-week semester program runs in the fall (August through December) and in the spring (January through May).

Research areas include projects from basic science through process engineering. Project areas may include advanced computing, quantum computing, improved sensors, high-energy materials, enhanced surveillance and satellite research, and new technologies that support the Laboratory's latest scientific directions. In support of the stockpile stewardship mission, students conduct research and contribute to basic science in areas

such as analysis and assessment, theory, computer modeling of complex systems, environmental stewardship and technologies, and nuclear science.

Students spend approximately 80% of their time conducting science research with their mentors and 20% of their time participating in special supplementary educational activities designed to provide them with an introduction to research that supports the Laboratory mission. The educational activities include tours, field trips, lectures, workshops, technology training, and demonstrations. In addition, students are instructed in preparing and displaying a scientific poster session, giving a technical presentation, and writing a scientific paper. Special seminar sessions that highlight research skills help strengthen student understanding of the research process.

The combination of individual scientific and engineering research guided by quality mentors, follow-up activities, return visits, and supplementary educational activities makes the CCP a powerful and unique opportunity for students.

**Project Goal, Objectives, and Milestones.** The goal of the CCP is to develop a diverse workforce of individuals with enhanced problem-solving and technical skills to meet the Laboratory's current and future scientific and technological needs and to contribute to the research of technical line organizations. The objectives of the CCP that support this goal are as follows: (1) to require that students contribute directly to ongoing Laboratory research projects; (2) to attract students to learn in Laboratory-identified critical skills areas; (3) to strengthen and focus students' fields of study and career plans; (4) to increase the diversity of students who participate in national research programs; (5) to increase students' knowledge and skills in science, math, engineering,

and technology topics; and (6) to increase students' understanding of the research process.

These objectives are measured and evaluated using instruments and techniques that include surveys, informal feedback from mentors and students, observations, and review of student products. Assessment tools are designed to provide coordinators and staff members with information to ensure a quality student research experience.

The following items are considered indicators of success:

- broad-based excellence in science and engineering;
- roles and expectations that are clearly defined;
- participation by colleges that have adequate infrastructure and support for co-op programs;
- Laboratory infrastructure and coordination that is adequately funded;
- participation by high-quality students, mentors, and university faculty members;
- a clear connection to Laboratory workforce needs;
- student-conducted research that is important and engaging;

- an educational component of the program that is tied to university curricula; and
- assessment information that is used for continuous quality improvement.

Students are recruited through a variety of strategies that include posters on campuses, a CCP web page, individual contacts at universities, student ambassadors (past participants), and recruiting visits by coordinators to targeted universities and colleges.

The future CCP student-recruitment effort will continue to target the best schools in science and engineering. After reviewing an initial assessment of top schools with co-op programs, we have decided to target Georgia Tech (2,363 co-op students), Texas A&M (1,064 co-op students), and the University of Michigan (300 co-op students). New Mexico and California universities will also be contacted to encourage their participation in the program.

Formal partnership agreements will be established with participating universities in 2003. The agreements will outline university commitments, including the identification of quality students and the participation of faculty members.

## McDermott Scholars Program

**Program Description.** Summer 2002 was the inception of the Eugene McDermott Scholars Program at Los Alamos National Laboratory (LANL, the Laboratory). This program provides the Laboratory with summer undergraduate research associates who are working toward a bachelor's degree in subjects ranging from electrical engineering to biology.

The Laboratory recognizes these young men and women as among America's most promising and talented students from a school that is one of the fastest growing public universities in the United States (U.S.)—the University of Texas at Dallas (UTD). The school of engineering and computer science at UTD ranks second nationally in the number of computer science graduates.

McDermott Scholars are recruited to UTD from a list of national and international finalists. They are selected on their promise of being leaders for Dallas, the U.S., and the world community during the 21st century. This promise is demonstrated by records of high intellectual achievement and evidence of leadership skills, high ethics, and a commitment to full participation in the program—with all its privileges and responsibilities.

The average grade point average of the five McDermott Scholars who interned at the Laboratory in summer 2002 was 3.97 on a 4.0 scale. These students are shown in Figure 49. The students performed research beside some of the Laboratory's best mentors. The contribution that these students brought to the Laboratory in such a short time is remarkable. Because it is extremely



*Figure 49. The five McDermott Scholars who interned at the Laboratory in Summer 2002, left to right are: Emily Hinz, Aidan Skoyles, Justin Appleby, Morgan Feeney, and Walter Voit*

important to the future of the Laboratory to attract the next generation of quality scientists and engineers, this partnership has promising prospects.

By all accounts, the Laboratory's collaboration with UTD and the exceptional McDermott Scholars Program was a tremendous success in fiscal year 2002 (FY02). The Laboratory will continue to collaborate with this program to attract these scholars to Los Alamos (see Table 16).

**Performance Goal, Objectives, and Milestones.** Leadership for the twenty-first century is the principal goal of the Eugene McDermott Scholars Program at UTD. The Laboratory recruits these students and provides them with a challenging and unique research opportunity by giving them access to facilities and state-of-the-art equipment not ordinarily available on a university campus and



**Table 16. Majors Represented by the McDermott Scholars at LANL in FY02**

Major	Specialization
Electrical Engineering	
Literary Studies (changed to Biology after LANL internship!)	Genetics
Geophysics	Computer Science
Electrical Engineering	Computer Science
Computer Science	

contact with many of the world's most illustrious scientists.

During the summer research sessions, the students do the following things:

- increase their knowledge and skills in their fields of study;
- increase their understanding of the research process;
- increase their understanding of national laboratories and the important research being accomplished at these facilities; and
- strengthen and focus their fields of study and career plans.

Strategically, this program targets the Laboratory's Institutional Goal #7: "Focus on diverse, entry-level, and strategic hiring." Diverse and entry-level students make up this program, and we are attempting to track these young professionals to ensure that the Laboratory will be a viable and challenging option when they are ready for postdoctoral appointments or permanent employment.

**Highlights of This Year's Accomplishments.** The 2002 McDermott Scholars arrived in May, and most were able to experience at least 10 weeks of research at the Laboratory.

- On June 26, the McDermott Scholars joined several other groups of honored scholars at an informal luncheon hosted by Laboratory Director John Browne. The students were welcomed, introductions were made, lunch was served, and the Director led an informative question and answer session.
- On July 25, the group was invited to tour the Reconfigurable Advanced Visualization Facility (RAVE). The RAVE is used to view complex, three-dimensional computational scientific data.
- On August 8, a total of 20 McDermott Scholars from the class of 2002 visited the Laboratory for a day of activities (Figure 50). (These students are possible summer 2003 interns.) The day began at the Bradbury Science Museum with welcoming remarks by William H. Press, Laboratory deputy director for science and technology. The scholars then watched a demonstration of the Acoustic Resonance Spectroscopy equipment that recently won an R&D 100 Award, and took a tour of the museum. The students then proceeded to the Visualization Laboratory at RAVE for a tour and demonstration. Afterward, the scholars split into two groups, one visiting



*Figure 50. Group of McDermott students visiting the Laboratory.*

the National High Magnetic Field Laboratory and the other participating in a discussion of Homeland Defense. During lunch, the group heard a presentation about prehistoric people and the Laboratory’s participation in the quest for our earliest ancestors. The last scientific discussion LANL provided was on the anthrax research being performed at the Laboratory. The tour ended with talks about student programs at LANL and discussions with mentors in the students’ fields of study.

**Mentor and Student Comments.**

**Mentors:**

*“(This scholar) proved to be a superb student assistant—bright, hard working, personable, a team player, and able to proceed with maturity and self-direction. (My) overall assessment (of the program): a strong success of great value to LANL and the student.”*

*“I was very impressed with (the scholar) because she walked into a situation in which she had virtually no experience and quickly learned complicated techniques, came to understand a new and dense scientific field, and presented that material in an authoritative manner.... From what I observed this summer, (this scholar) is undoubtedly a leader. She is a brilliant, brave, creative, and compassionate young woman who will go far.”*

*“My experience this summer with (this scholar) and this program has been a delight.... (This scholar) is a capable student, easily motivated, and tenacious in pursuit of his goals. I would welcome (this scholar) or another student back in the future without reservations.”*

*“In spite of the primitive facilities provided by my division, (this scholar) made a substantial contribution to the climate-modeling program here and learned what scientific software engineering really entails.”*

*“(This scholar) came to us possessing very good computer skills, which we quickly put to use for the Laboratory’s benefit. He was able to take instruction quickly and use his knowledge of computers to advance the project in several areas.”*

*“(This scholar) was also able to use knowledge from his beginning classes in electrical engineering during his summer stay. He calculated busbar losses in the magnet power system for the proposed AHF (Advanced Hydrotest Facility) layout. He also performed calculations using Excel to optimize busbar size. These were excellent tasks and very well done for a freshman in college.”*

*“We were very happy with (this scholar’s) performance this summer and would take him back anytime.”*

**Students (see Table 17):**

*“...I enjoyed learning about GIS (the geographic information system) and the Arc software suite. I*

**Table 17. Students’ Suggestions for Summer 2003**

Housing	Training	Timing
Need more flexibility for changes.	Site-specific training could be done on the afternoon of the new-hire process.	“...Two to three months are never enough time to truly become efficient in a job.”
	Let students “test out” of GET (General Employee Training). Could gain a whole day of work this way.	
	Supply more resources for the students. Want information to give one more depth of knowledge about the summer’s research.	

*never knew that GIS was so complicated or so powerful. Thanks for making a **great** summer possible.”*

*(I liked) “the scientific and educational climate ... (and) asking LOTS of questions and having them sufficiently (and sometimes over sufficiently) answered.”*

*“I learned a lot of things and have started to appreciate science a lot more. My mentor was absolutely wonderful. She was supportive and helpful; she taught me a lot, and she was a lot of fun too.”*

*“I have learned more this summer than I ever could have learned in a year’s worth of formal education. I have enjoyed the summer immensely and learned the most important thing about computer science: Programming is never, ever, about the code, but about the problem and the elegant solution.”*

*“This summer I helped design a 50-GeV proton accelerator for the Neutron Science Center’s Advanced Hydrotect Facility at LANL. I was exposed to a side of electrical engineering at LANL which I would have no exposure to at any university, and (I) thoroughly enjoyed my*

*experience. Although before the summer I had not considered research as a realistic occupational endeavor, I am now seriously considering the option of scientific research in the future.”*

*“This summer I worked at Los Alamos—and I glow. Fortunately, it is not a radioactive shimmering that from me exudes, but rather the smile on my face from the awesome summer I had swimming through a plethora of information on UNIX supercomputers for large-scale ocean simulations. Specifically, I edited code for a Visual Editor in C++ to help edit input parameters for these ocean models.”*

**Planned Improvements for FY03.** Outstanding as the McDermott Scholars are, they are incoming sophomores at the time when the Laboratory recruits them, so the competition for internship positions at the Laboratory is rigorous. Therefore, pressure will be placed on the students to decide earlier in the year whether or not they want to intern at the Laboratory. Those who decide to come will be included in the first Distinguished Students Program work session in November. We are encouraging those who will be returning to stay in contact with their summer 2002 mentors so that positions will be reserved for them.



# Graduate Research



## Graduate Research Assistant Program

**Program Description.** The GRA Program at the Laboratory is a year-round educational program that provides students from across the world with relevant research experience while they are pursuing a graduate degree program.

To be eligible, an applicant must hold a bachelor's degree and be accepted and enrolled in a graduate program. Appointments are available in both technical and administrative fields for 90-day summer internships. Interns have the option to continue part-time work during the academic year. Students are selected on the basis of field of study, research interests, and Laboratory needs. In some cases, students may arrange to conduct their master's or doctoral thesis research at the Laboratory.

The degrees pursued by the graduate students in this program are extremely varied, ranging from quantum mechanics and astrophysics to computer science, materials science, and cancer research. Positions are also available in non-technical areas such as financing, human resources, and industrial business development. Once they have completed their degrees, GRAs may be converted into available Laboratory staff positions (see Figure 51).

### Program Goal, Objectives, and Milestones.

The goal of the GRA program is to provide the Laboratory with a

pool of entry-level professional talent. The goal is met by the following objectives: to provide participants with access to the resources of a world-class, state-of-the-art research facility; and to provide participants with an opportunity to interact with professional staff members who are experts in fields such as physics, materials science, computer science, and engineering.

**Highlights of This Year's Accomplishments.** In FY02, 887 students applied to the GRA program. Approximately 65% were selected for internships. A total of 573 students from 192 colleges and universities participated in the program.

Thirty-one GRAs showcased their research in oral technical talks and poster presentations at Symposium 2002: *Championing Scientific Careers*. Figure 52 shows awards being presented to two GRA students. Their research topics ranged from "The Implication of a Tradeable REC

Market: The US Context" to "Experiments to Support the Design of a Field Scale Colloid Test at the Yucca Mountain Alcove8/Niche 3 Complex."

The outstanding-poster awards in the fields of biosciences, chemistry, earth and space sciences, and mathematics went to GRAs, as did the outstanding-oral-presentation awards in the chemistry, mathematics, and nontechnical categories.



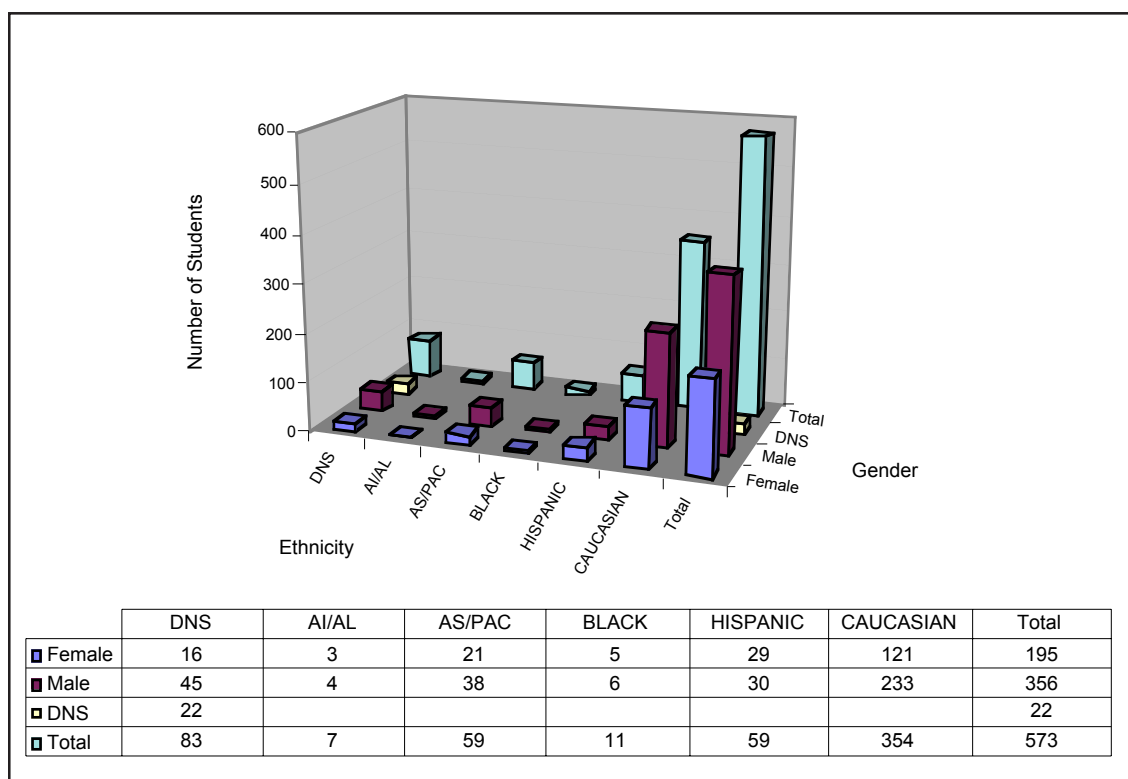
*Figure 51. Alina Deshpande has worked for LANL for almost 9 years. She and her mentor, John Nolan, work closely in B Division. Alina feels that the best parts about her experience with the Laboratory are the sources of knowledge that she can access easily and the warm friendly atmosphere created by her coworkers and her mentor.*





**Figure 52.** Laboratory Associate Director for Administration Richard Marquez, left in each photo, presents the award for the outstanding oral presentation in chemistry to Jason Sonnenberg whose presentation was entitled “Theoretical Studies of Bonding in Uranyl Complexes,” and to Mirium Nuño whose topic was “The Immune System and Influenza A Virus.”

Figure 53 shows ethnicity and gender data for GRA students.



**Figure 53.** FY02 ethnicity and gender of GRA students.



## National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM Fellowship Program)

**Program Description.** Every year a significant number of people from underrepresented minorities enter undergraduate engineering and science programs, but underrepresented minority group members make up less than five percent of the recipients of advanced degrees in engineering or science.

The National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM), a nonprofit organization, was formed in 1976 to address this problem. Specifically, GEM exists to increase the number of American Indian, African American, and Latino, Puerto Rican, and other Hispanic Americans pursuing graduate degrees in engineering, the physical sciences, and natural science disciplines. GEM fellows obtain practical work experience through summer internships at GEM employer work sites.

GEM is a tax-exempt, nonprofit corporation headquartered at the University of Notre Dame in Indiana. GEM is jointly sponsored by a consortium of university and company members and is governed by a board of directors composed of GEM representatives from the members. The board is responsible for policy and serves as the legal representative for the GEM Consortium.

GEM is a center of excellence engaging in activities that reach beyond recruitment and retention, leading students to graduation from master's degree and doctor's degree programs in engineering and science. Through GEM, comprehensive nationwide programs have been established to identify, recruit, and enroll minority science and engineering students in graduate programs leading to advanced degrees. GEM offers master-of-science engineering, doctoral engineering, and

doctoral science fellowships. In addition, GEM produces publications and videos for graduate, undergraduate, and precollege students. GEM also provides courses to prepare undergraduates to succeed in graduate classes and guidance for graduate-level students on how to achieve success in doctoral research programs.

For more than 25 years, GEM companies and universities have worked together, providing graduate education in engineering and science to more than 2,140 underrepresented minority group students. GEM is a unique network of universities, companies, government agencies, alumni, and faculty members. Through this collaboration, the success of students attaining graduate degrees is maximized.

As a corporate member of the GEM Consortium, Los Alamos National Laboratory (LANL, the Laboratory) provides funding for sponsored GEM fellows to pursue Master's and Doctoral degrees in engineering and science. In addition, the Laboratory provides funding for the fellows to spend two consecutive summers conducting research at LANL.

The scientific employment pipeline at the Laboratory benefits greatly from the LANL partnership with the GEM Consortium and from the consortium's success. The Laboratory has sponsored 43 GEM fellowships since becoming a corporate member in 1979.

The Quality Education for Minorities Network awarded GEM its 2001 "Exemplary Mathematics, Science, and Engineering Partnership Award" for a successful contribution to the achievements of minorities.

To learn more about GEM, visit <http://www.nd.edu/~gem/>.

### **Performance Goal, Objectives, and Milestones.**

GEM's mission is to enhance the value of the nation's human capital by increasing the participation of underrepresented minority group members at the master's and doctoral levels in engineering and science. GEM accomplishes this goal by identifying and attracting high-quality students to graduate school in engineering and sciences and by providing the most cost-effective process for matching students with the needs of member universities and company sponsors.

The intent of the Laboratory's corporate membership in the GEM Consortium is to establish a sustained and continuing pipeline of minority-group graduate students in science and engineering feeding into the Laboratory's research population and pursuits. Membership in GEM is an indication of the Laboratory's commitment to human and research diversity.

The Laboratory's recruitment strategy for the program involves, primarily, educating students in the existing summer internship programs on the merits and benefits of a GEM fellowship. Additional recruitment is carried out by Laboratory representatives while they are conducting campus visits and going to career fairs to encourage students to consider summer and/or academic-year research opportunities and, eventually, career options at the Laboratory.

Finally, the Laboratory's GEM alumni are instrumental in marketing the program to potential future fellows. Currently, two alumni serve on the Laboratory's GEM Selection Committee, established in fiscal year 2000 to ensure suitable and talented selection of the Laboratory's GEM fellowship recipients.

### **Highlights of This Year's Accomplishments.**

This year, LANL awarded a GEM fellowship to Matthew Honaberger, a December 2001 graduate

of New Mexico State University, where he had majored in chemical engineering and carried a 3.56 grade point average (on a 4.0 scale). Honaberger served his internship at the Laboratory under Chang Yub Kim in the Wright Langham Resource Group (B-2) in the Bioscience Division.

Honaberger's research in B-2 focused on the development of a new tool to analyze protein-protein interactions in *Mycobacterium tuberculosis* (the agent that causes TB). His learning objectives included a broad range of research techniques such as molecular biological protein expression systems and/or functional analysis by a proteomics approach using the techniques of affinity column, two-dimensional electrophoresis, mass spectroscopy, and database analysis.

Following are some comments from Honaberger's assessment of his experience at LANL.

Question: To what extent did your summer internship effect a change in you?

*"Although my work ethics and personal responsibility and work habits were not affected by this job, I gained invaluable experience working in amazing facilities with equipment that most laboratories could not afford."*

Question: In what way did your summer internship relate to your professional goals?

*"It helped solidify my conviction to perform research eventually on proteins—protein engineering...."*

*"The best part of my internship was my relation with my supervisor, Chang. He provided the perfect amount of guidance and allowed me to learn on my own when I needed to. He did an excellent job!"*



## Hertz Foundation Scholars Program

### Fannie and John Hertz Foundation

*Devoted to Applications of the Physical Sciences*

**Program Description.** This graduate program, in its second formal year of collaboration with Los Alamos National Laboratory (LANL, the Laboratory), provides summer graduate research associate positions to Hertz Foundation Scholars. The students chosen are working towards doctoral degrees in fields ranging from electrical engineering to molecular biomedicine. The Laboratory recognizes that these young people possess some of America's most promising technical talent and have received recognition from one of the most prestigious foundations in the nation. The average grade point average of the fiscal year 2002 (FY02) group of students was 3.91 on a 4.0 scale.

Each spring, Hertz Scholars are recruited for summer positions at the Laboratory. Those considered for selection come from the list of finalists who are competing for the Hertz Foundation Graduate Fellowship Award. To be eligible, the students must be majoring in applied sciences (aeronautics, biology, computer science, materials science, etc.). The Hertz Foundation only accepts applications from students who will be attending one of 36 prominent graduate schools (see Table 18). Only 20 students actually receive the fellowship award, which consists of a cost-of-education allowance and a personal-support stipend.

At LANL, the Hertz students work beside some of the Laboratory's best mentors. The contribution that these students bring to the Laboratory in such a short time is remarkable, making this collaboration an incredible success. Because it is extremely important to the future of the Laboratory to attract the next generation of quality scientists and engineers, this partnership has great value.

**Table 18. Schools Attended by This Year's Hertz Foundation Scholars**

Undergraduate/Graduate School	Number of Students
Cambridge University	1
Stanford University	2
Texas A&M University	1
University of St. Thomas	1
The Johns Hopkins University	1
Georgia Institute of Technology	1
Brown University	1

To enhance the FY03 program, the Laboratory is contacting the 2001 and 2002 finalists and asking them to submit their resumes for the Distinguished Students Program. Each of the finalists will be provided with a list of possible Laboratory-Directed Research and Development projects as an enticement to recruit them to the Laboratory.

The Laboratory will continue to collaborate with the foundation to attract these scholars. The Hertz Foundation wants its fellows to make a moral commitment to make their "skills available to the United States in times of national emergency...." What better way for them to meet this commitment than to contribute to national security! Maybe in 2003, these scholars will be able to assist our Homeland Defense Program at the Laboratory.

When the Hertz Fellowship Awards were announced in April 2002, the Laboratory received

copies of the applications of the finalists and the fellows. Each of these students was contacted to determine whether he/she would be interested in a summer research position. Those who were attracted by the challenging research that the Laboratory has to offer responded to the invitation. At this point, the Laboratory began a search for the best mentor and research experience for each student. Some of these talented students actually had several research offers and were allowed to choose the option that best fit their studies (see Table 19).

**Table 19. Profile of Undergraduate Majors**

Major	Specialization
Mathematics	Theoretical Computer Science
Aerospace Engineering	Stability and Control of Autonomous Vehicles
Applied Physics	Device Physics
Applied Physics	Condensed Matter Physics
Computer Science	Scientific Computing
Materials Science and Engineering	Photonics
Theoretical Physics	
Electrical Engineering	Communications

### Performance Goal, Objective, and Milestones.

The principal goal of the Hertz Foundation Scholars Program is to encourage some of our nation's most talented graduate students to share their expertise with the Laboratory, which, in turn, provides them with a challenging and unique research opportunity. While at the Laboratory, they have access to facilities and state-of-the-art equipment not ordinarily available on a university campus. They also have contact with many of the world's most illustrious scientists.

During the summer research sessions, the students do the following things:

- increase their knowledge and skills in their fields of study,
- increase their understanding of the research process,
- increase their understanding of national laboratories and the important research accomplished at these facilities,
- strengthen and focus their fields of study and career plans, and
- tour various facilities at the Laboratory and meet personally with the Director.

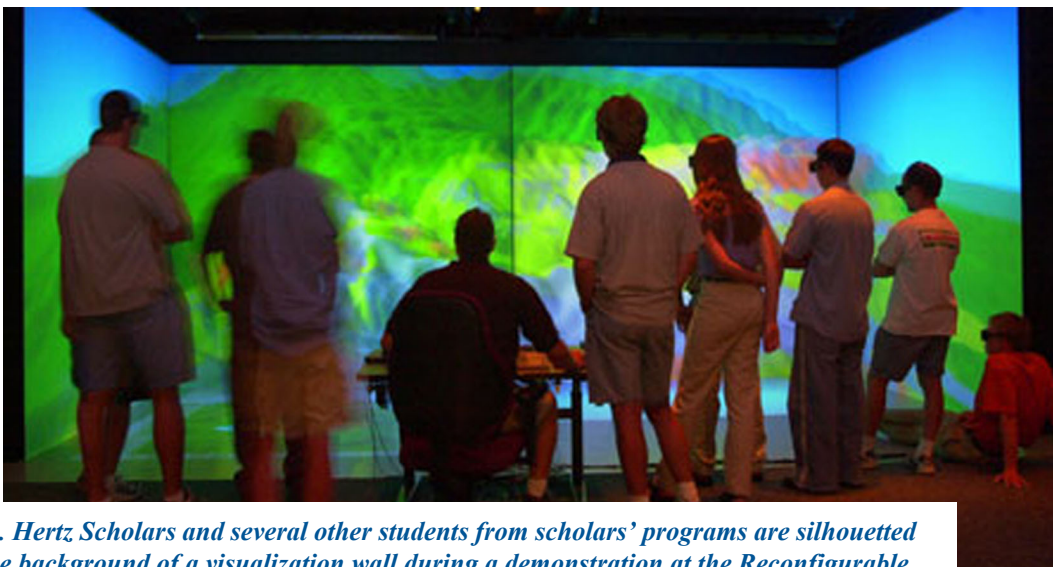
Strategically, this program targets the Laboratory's Institutional Goal #7: "Focus on diverse, entry level, and strategic hiring." Diverse and entry-level students make up this program, and we are attempting to track these young professionals to ensure that the Laboratory will be a viable and challenging option when they are ready for postdoctoral appointments or permanent employment.

### Highlights of This Year's Accomplishments.

Hertz Foundation scholars arrived from May through July 2002, and most were able to experience at least 90 days of research at the Laboratory.

- On June 26, 2002, the Hertz students were joined by the McDermott Scholars and two other groups of honored scholars at an informal luncheon, hosted by Laboratory Director John Browne. The students were welcomed, introductions were made, lunch was served, and the Director led an informative question and answer session.
- On July 25, the Hertz Scholars were invited to tour the Reconfigurable Advanced Visualization Facility (RAVE). The RAVE is used to view complex, three-dimensional computational scientific data (see Figure 54).
- Three Hertz Scholars from summer 2001 returned in 2002.
- Several students wrote papers resulting from their research at the Laboratory. Those papers are scheduled to be published in the very near future.





*Figure 54. Hertz Scholars and several other students from scholars' programs are silhouetted against the background of a visualization wall during a demonstration at the Reconfigurable Advanced Visualization Environment Facility at Technical Area 3. The students are wearing goggles to see the full effects of three-dimensional modeling and simulation. The facility is used to view complex, three-dimensional computational scientific data.*

## 2002 Mentor and Student Comments.

### Mentors:

*"(This scholar) is easily the best student I have ever had the pleasure of working with. Although he will only just be starting his first year of graduate school (at Stanford), he is already working at the level of a very competent second- or even third-year grad student. He is highly motivated and extremely bright and raises the bar for student performance in the Lab. His presence this summer allowed us to attempt a rather speculative (high-risk, high-payoff) experiment. Without such a talented student, we would never have attempted this idea. In summary, the Hertz Scholar Program has been a tremendous benefit to our work and has provided (the scholar) with an opportunity to work on a cutting-edge research project with results that will be, in our opinion, immediately publishable in the highest-quality scientific journals. I trust the Laboratory continues its support of the successful Hertz Scholar program."*

*"(This scholar) was a pleasure to work with—friendly and thoughtful, and mathematically quite talented. He was quick to understand ideas and see where we might want to push them, and also*

*quite efficient in putting software together to implement the ideas. I hope the program continues, and I hope you put me on your list of possible mentors for next summer."*

*"(This scholar) comes from a theoretical background and had no prior experience with hands-on work. In order to round out his abilities a little, I concentrated on introducing him to more practical matters.... Mentoring ... was also a good experience for me. It is always fun to work with young and talented people, especially here at the Lab where there are so few young employees. I think this is a great program."*

*"(This scholar) has been a great asset to our research program. We only wish he could stay longer. The ability to attract students of this caliber make this Hertz Scholars Program very beneficial, both in the short term, for getting good summer-student help, and in the long term, for recruiting technical staff members."*

*"(This scholar) was a very bright and enthusiastic worker. He is still early in his graduate career and hasn't decided on an area of focus yet. This summer's work exposed him to the computational and modeling aspects of physics, where his previous experience had been more experimental."*

*He became quite productive near the end, and we would be glad to host him or similarly talented students again."*

*"(This scholar) was an exceptional student. He worked with me in developing a computer code for the analysis of mass spectrometry data. The project was quite successful, and he wrote the entire code. He gained an understanding of the technical aspects of the project quickly."*

**Students:**

*"Overall, I have liked the atmosphere at the Laboratory; it is somewhere between academia and industry. There are obviously a lot of very smart and nice people here. I was also glad to have the opportunity to present in the (2002) Symposium."*

*"I just wanted to say thanks again for inviting me to LANL this year. I had a great time. My mentor ... was absolutely the best match possible for me. I don't know how that happened, but I'm glad it did. Unfortunately, I will not be able to return to LANL next summer. I will be burning the midnight oil trying to finish up my master's thesis. As far as future plans ... we'll see! I have a feeling I'll be talking to you later, so until then ... take care out there in the Wild Wild West!"*

*"I really enjoyed the tour that you set up for us this summer. I had a really good summer again this year."*

*"It's tough to sum up the LANL experience in a couple of sentences. As a mathematician, I was really interested in the theoretical aspects of my particular research project, and I was given the freedom to pursue these research interests with the guidance and assistance of my mentor. I found the student/mentor relationship one of the most valuable aspects of the experience; our relationship was much more a mutual collaboration on a research problem than a boss assigning tasks and responsibilities.... I look forward to coming back, possibly, in later summers."*

**Suggested Improvements.** First, we are asking that the Laboratory receive the list of finalists for summer 2003 research sessions from the Hertz Foundation at the end of January 2003. By establishing the number of Hertz students who want to return and determining how many will be arriving for their first research assignment here at the Laboratory as early in the year as possible, we will make it possible to reserve apartments where scholars can share space. This approach will allow for more Hertz students to experience the opportunities that abound here at the Laboratory. Second, we are requesting that during the Hertz Foundation Board interviewing process, a Laboratory representative be allowed to make a formal presentation to the interviewees concerning the summer research experience at the Laboratory.

## National Physical Science Consortium Graduate Fellowships in the Physical Sciences

*“Strengthening diversity among U.S. scientists and engineers is more than a worthy goal; it is an imperative.”*

**Program Description.** The National Physical Science Consortium (NPSC) is a unique partnership between industry and higher education. Established in 1987, the NPSC is headquartered in Los Angeles.

The NPSC has one primary objective: to increase the number of doctorates earned in the physical sciences and related engineering fields by qualified United States (U.S.) citizens, emphasizing women and historically underrepresented minorities. The program achieves this objective by awarding doctoral fellowships to outstanding students and by facilitating the creation of research and employment opportunities.

Strengthening diversity among U.S. scientists and engineers is more than a worthy goal; it is an imperative. The U.S. has long led the world in advancing the physical sciences, but if our nation is to continue competing on a global scale, it must be able to train and recruit a diverse pool of qualified scientists.

Why is this so important? Even while the population of historically underrepresented minorities in the U.S. has grown significantly, the number of U.S.-born physical scientists, both in industry and in academia, has fallen:

- Of the physical sciences doctorates granted in 1998, only 54% went to U.S. citizens.
- Of nearly 6,000 engineering degrees granted in 1998, only 43% went to U.S. citizens.

- Of all U.S. citizens granted Ph.D.s in the sciences and related engineering fields in 1998, women accounted for only 37%; and African Americans, Hispanics, and Native Americans accounted for only 17%.

Foreseeing this trend nearly two decades ago, a national task force recommended creating the NPSC. Initially funded by the National Science Foundation, Lawrence Livermore National Laboratory, and the U.S. Department of Energy (DOE), the NPSC is now self-sustaining through a modest endowment and from annual membership fees from employer members, of which Los Alamos National Laboratory (LANL, the Laboratory) is one. Since granting its first fellowship award to seven young scholars in 1989, the NPSC partnership has provided fellowships to nearly 300 aspiring scientists and engineers. Of these, nearly half are members of minority groups, and three-quarters are women. Since 1989, the NPSC has sponsored 217 women—72% of the people selected for the program.

Because the NPSC is helping to provide a continuous source of U.S.-born scientists, employers and universities can achieve diversity and balance in our nation’s scientific community. In addition, the NPSC is helping today’s promising young scientists—tomorrow’s science leaders—realize their dreams.

The Laboratory has sponsored seven women since 1989. They make up approximately 78 percent of those sponsored by the Laboratory during that period of time (Table 20).

**Table 20. Ethnicity of Fellows Sponsored by LANL Since 1989**

<b>African American Female</b>	<b>American Indian Male</b>	<b>Hispanic Females</b>	<b>Hispanic Male</b>	<b>White Females</b>
1	1	3	1	3
11%	11%	33%	11%	33%

**Performance Goal, Objectives, and Milestones.**

By working with the National Physical Science Consortium, the Laboratory hopes to increase the existing pool of Ph.D.s in the physical sciences, placing special emphasis on diversity while supporting the DOE and Laboratory missions. To help achieve these important missions, the NPSC focuses student research assignments on the Laboratory's critical-skills areas.

**Highlights of this Year's Accomplishments.** The Laboratory sponsored four students through the NPSC during FY2002 (FY02). Three of these students represented continuing sponsorships. One new fellowship was awarded (Table 21).

**Table 21. FY02 Participant Demographics**

<b>Ethnicity</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
Anglo	0	1	1
Hispanic	1	2	3
<b>Total</b>	1	3	4

**FY02 Schools Represented.** The students in the program in FY02 came from the following schools: Indiana University, the University of

California at San Diego, the University of New Mexico, and the University of Washington.

**Participant Profile.** In FY02, the Laboratory awarded an NPSC fellowship to Kate Denning.

In FY01, Denning was a student in the Los Alamos Summer School (LASS), a program funded by the DOE/Defense Programs Office of University Partnerships. During her LASS experience, she became interested in the research being conducted by Garrett Kenyon, a neuroscientist in the Biophysics Group (P-21) in the Physics Division.

The Laboratory arranged for her to participate in correspondence computational research while she finished her degree at Ft. Hays University in Kansas, where she graduated in May 2002 with a 3.93 grade point average (based on a 4-point scale) in physics. She returned to the Laboratory in the summer of 2002 to work as an Undergraduate Post Baccalaureate. She commented, "I have enjoyed my experience with LANL so much that I have decided to follow this line of work as a career. This fall, I plan on attending the University of California-San Diego in order to attain a Ph.D. in computational neurobiology."

In addition to being awarded an NPSC fellowship, she also received a 2002 National Science Foundation fellowship.





## Oak Ridge Institute of Science and Education

*Educational and Research Experiences*

**Program Description.** “Are there enough well-trained professionals to meet this country’s science and technology needs?”

The Oak Ridge Institute of Science and Education (ORISE) has been addressing this issue since 1946.

ORISE administers research participation, fellowship, scholarship, and internship programs for the U.S. Department of Energy (DOE) and other federal agencies. By identifying future manpower needs in key scientific and technical areas and connecting talented students with scientific leaders, ORISE is helping to prepare tomorrow’s scientific workforce.

A consortium of 85 doctorate-granting colleges and universities (The Oak Ridge Associated Universities [ORAU]) manages ORISE. The consortium includes a significant representation of minority-serving institutions. ORAU operates ORISE to provide operational capabilities and to conduct research, education, and training for the DOE in the areas of science and technology, national security, environmental safety and health, and environmental management.

ORISE programs target faculty members, post-graduates, graduates, and undergraduates involved in science, mathematics, or engineering. ORISE offers a variety of educational opportunities, all of which present 10- to 12-week summer practicums at participating DOE sites. Participants receive guest appointments at the host facility, but they are not considered contractors or employees of the facility, of Oak Ridge Institute of Science and Education, of the Oak Ridge Associated Universities, or of the DOE.

Through its partnership with the Oak Ridge Institute of Science and Education (which began in FY1983), Los Alamos National Laboratory (the Laboratory) strengthens its ties with the academic community while focusing on developing a highly trained, diverse workforce to help meet U.S. science and technology needs.

(For more information on ORISE, visit <http://www.ornl.gov/orise.htm>.)

### **Performance Goal, Objectives, and Milestones.**

Utilizing state-of-the-art research facilities, the Laboratory, in partnership with ORISE, recruits and places students and faculty members in summer research projects that support the DOE and Laboratory missions. The primary goal of the program is to stimulate and encourage highly talented students to pursue careers in research at the Laboratory.

During FY2002 (FY02), two programs were available for undergraduate and graduate students working at the Laboratory on ORISE internships: the Nuclear Regulatory Commission (NRC) Historically Black Colleges and Universities Student Research Participation Program, and the Office of Biological and Environmental Research (OBER) Minority Institutions Student Research Participation Program.

Two graduate students were awarded OBER-funded Laboratory internships. OBER offers opportunities for students to participate in research relating to health and the environment—programs that directly address the Laboratory mission to solve national problems in energy, environment, infrastructure, and health security.

### Highlights of This Year's Accomplishments.

Because ORISE received extra OBER funding in FY02, both graduate students were funded beyond the normal 10-week summer appointment and allowed the opportunity to do research at the Laboratory for six consecutive months. These students and their work are described in the following paragraphs:

- **Heather Alexander** (Figure 55) is a candidate for a master's degree in "biology: ecology and evolution" at New Mexico State University (NMSU). She has a 3.7/4.0 grade point average. She first came to the Laboratory in the summer of 1998 as an undergraduate student. Since that time, she has worked on projects using DNA analysis, has experienced



*Figure 55. Heather Alexander labeling a sample of black bear scat for DNA analysis. She is researching what effect the Cerro Grande and Vivach fires have had on the black bear populations found in the Jemez and Pecos Mountain areas. Both fires occurred in the spring of 2000 and covered more than 70,000 acres. The scat was collected in the identified control area comparable to the Cerro Grande fire area.*

significant field and laboratory work, has supervised students, has written several publications, and has been named an "Outstanding Laboratory Student" (twice). She plans to obtain a doctorate in molecular biology/genetics and would like to pursue permanent employment at the Laboratory. Her research topic at the Laboratory was "Genetic Analysis: Determining the Effects of Forest Fire on the Spatial Characteristics and Genetic Relatedness of the Black Bear Population." She performed collaborative research with Jon Longmire of the Bioscience Division and several staff members in the Risk Reduction and Environmental Stewardship Division's Ecology Group.

- **Kelly Gallagher** holds a master's degree in biology from California State University at Fresno and is a doctoral candidate at NMSU. Her current research involves utilizing field-based techniques, state-of-the-art molecular-genetic data, biological computation, and statistical inference to understand evolutionary and environmental processes for the ultimate benefit of the conservation of Southwest native-plant populations made up of a relatively small number of individuals. Her project will be one of the first studies of its kind to use measurements of quantitative genetics in field environments. She is working under the direction of her advisor, Brook Milligan of NMSU, and her Laboratory mentor, Scott White. She would like to continue her concentrated efforts toward applied environmental and life sciences and ultimately conduct research, teach, and act as a mentor in an academic setting.



## South Carolina Universities Research and Education Foundation

**Program Description.** Incorporated in 1998, the South Carolina Universities Research and Education Foundation (SCUREF) is a consortium composed of the four major research institutions in South Carolina: Clemson University, the Medical University of South Carolina, South Carolina State University, and the University of South Carolina. The primary goal of SCUREF is to enhance educational programs and research opportunities of the participating universities through collaboration. The consortium utilizes these universities to manage its research and education programs. One of these programs is the Department of Energy Nuclear Engineering and Health Physics Fellowship/Scholarship (NE/HP) graduate program. The program is managed through the Medical University of South Carolina Office of Special Programs. Los Alamos National Laboratory (LANL, the Laboratory) is one of nine participating centers for the NE/HP program. Fiscal year 2002 (FY02) was the fourth year that the Laboratory participated in the program.

(For more information on SCUREF, visit <http://hubcap.clemson.edu/SCUREF/>.)

### **Performance Goal, Objectives, and Milestones.**

Through its participation in the NE/HP program, the Laboratory supports its mission while focusing on the development of a future workforce in the critical skills of nuclear design and evaluation, physics, and hazard-ranked facility operations and security.

### **Highlights of This Year's Accomplishments.**

Four NE/HP SCUREF fellows were recruited to the Laboratory in FY02. Each spent a continuous 12-week period conducting research. These students and their work are described in the following paragraphs:

- **Brian Miller** is a doctoral candidate in nuclear engineering at the University of New Mexico. He has a 3.89 grade point average (on a 4.0 scale). Summer 2002 was Miller's third summer at the Laboratory on a SCUREF fellowship. His research, performed under the tutelage of Randal Baker, Transport Methods Group (CCS-4), was to develop a first collision source method that included determining the eigenvalue system. Miller is currently a graduate research assistant at the Laboratory and is working on his dissertation, which is entitled "A First Collision Source for Discrete Ordinates Eigenvalue Problems."
- **Eduardo Farfán** holds a doctorate in nuclear and radiological engineering from the University of Florida at Gainesville. He has a grade point average of 3.83 (on a 4.0 scale). His research topic at LANL employed Monte Carlo neutron and photon transport code (3-D) to evaluate uncertainties of the activity measured by high-purity germanium detectors that may be caused by variability in location of weak x-ray emitters in the human lung. His laboratory mentor was Malcolm Ennis, Health Physics Measurements Group (HSR-4). Upon completion of his internship, Farfán became an assistant professor in nuclear engineering at South Carolina State University in Orangeburg, South Carolina.
- **Travis Grove** is a candidate for a master's degree in nuclear engineering at the University of Illinois at Urbana-Champaign. He holds a 3.9 grade point

average (on a 4.0 scale). His research at the Laboratory involved the performance of various neutron transport calculations using a Monte Carlo neutron and photon transport code. In addition, he analyzed experimental data from subcritical and critical neutron measurements using a wide variety of analytical tools. His Laboratory mentor was Peter Jaegers, Advanced Nuclear Technology Group (NIS-6).

- **Hilary Teslow** is a doctoral candidate in nuclear engineering and radiological sciences at the University of Michigan,

Ann Arbor. She holds a 3.7 grade point average (on a 4.0 scale). Her mentor at LANL was Hans Herrmann, Plasma Physics Group (P-24). Her research involved the atmospheric-pressure plasma jet. She created a model of the afterglow of the plasma that was used, as well as taking various data measurements. Teslow presented the results of her research at the 2002 LANL All-Student Symposium as well as at the Gaseous Electronics Conference in Minneapolis/St. Paul, Minnesota.